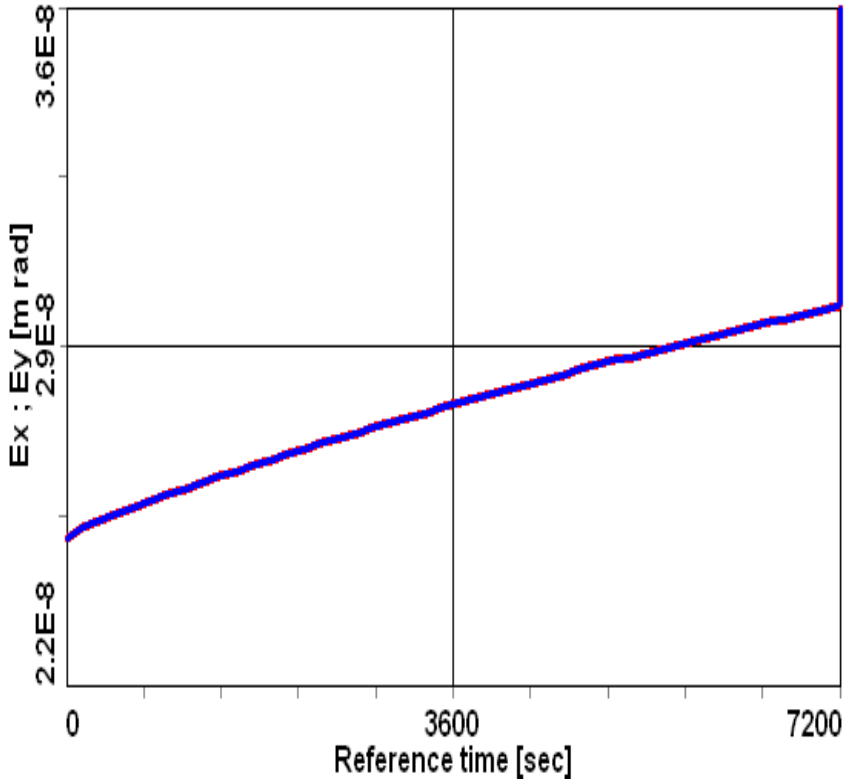
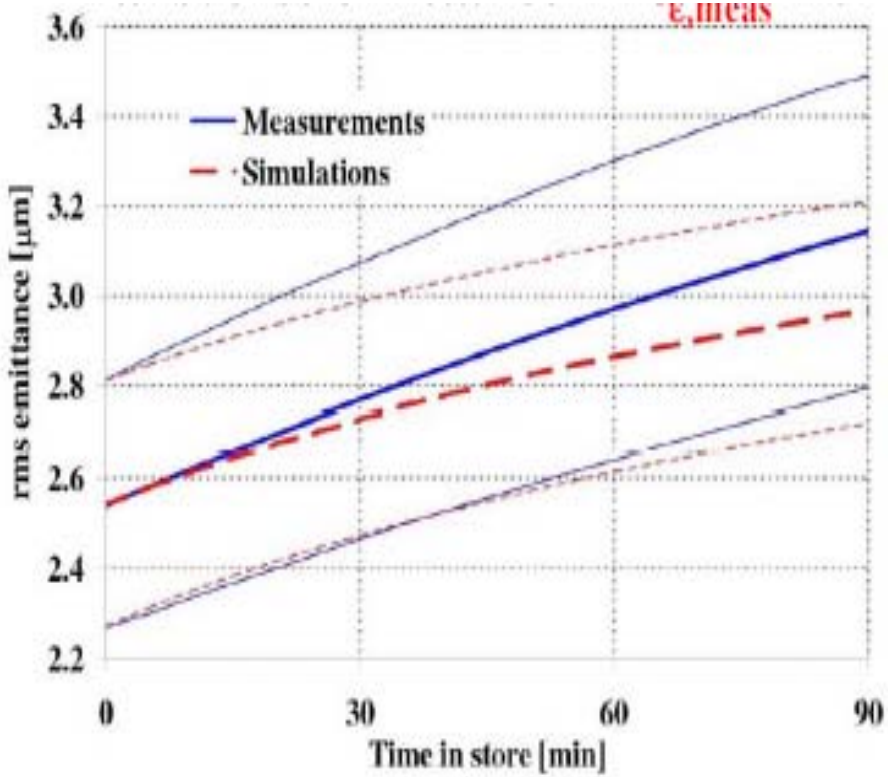
# Typical IBS emittance growth at 100 Gev Au – comparison with experiment

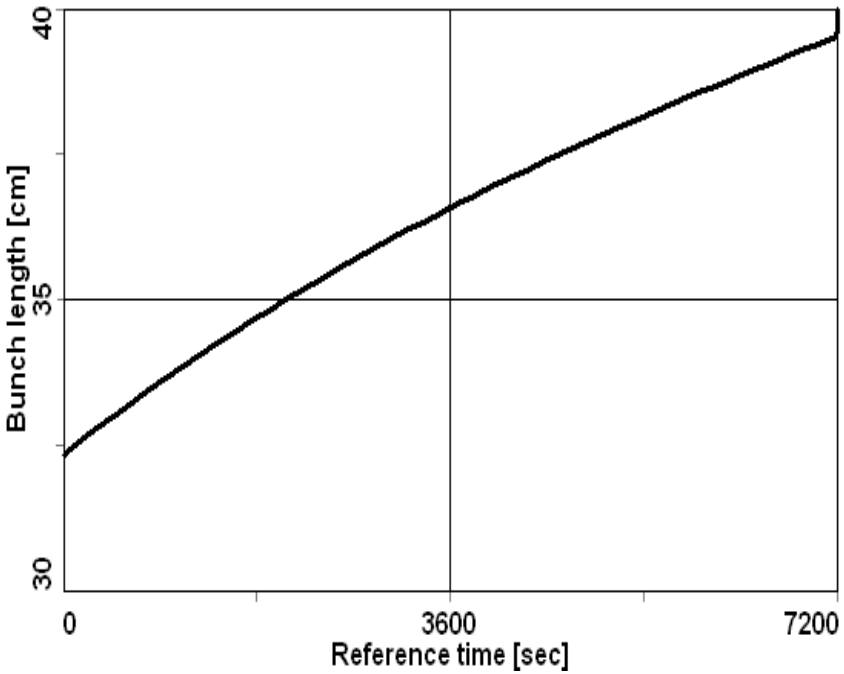



IBS simulation: Martini's model

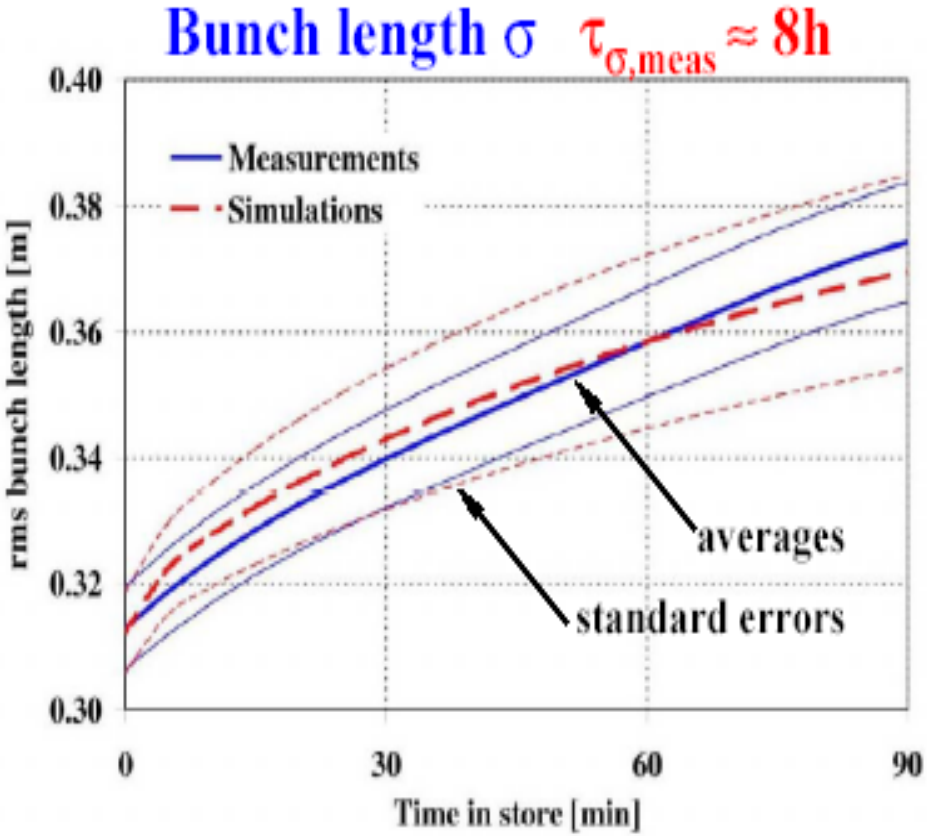



W. Fischer et al, 2001

# Typical bunch length growth due to IBS at 100 GeV Au ions




IBS simulations: Martini's model




W. Fischer et al. 2001

# For typical store parameters

**Longitudinal:**

**simulation agree with measurement within few percent**

**Transverse (typical example):**

**measurements (in 1.5 hours): – 25 % growth**

**simulations: - 14% growth**

**- However, emittance was extracted from luminosity (not a direct measurement) plus collisions – this may explain factor of 2 difference in transverse emittance growth.**

**This year we tried dedicated measurements of IBS - also using IPM to determine transverse emittances growth.**

# Simulations - Models

Various models for IBS were implemented in BetaCool code:

Piwinsky, Martini, Bjorken-Mtingwa, Wei, plasma-relaxation

- Benchmarking of various models was presented (November'2003, January'2004) at e-cooling meetings.

For present studies we use Martini's (Bjorken-Mtingwa) model of Intra Beam Scattering (IBS).

# Special 2004 setup

- Long bunch, small dp/p (RF h=360, 300 kV)

- enhanced IBS longitudinally

- suppressed IBS transversely

Experiments January-February 2004:

Longitudinal : measurement and simulation - similar growth 70-80%

Transverse: measurements: 20-30% growth

simulations: less than 10% growth ???

Needed test for different intensities and emittances to understand what is happening.

# March 16 data

- 6 bunches of different intensity with similar to previous setup
- Collisions were on for half of the time (21:00-21:35) but measured growth is similar to previous growth without collisions.

Data: both in Blue & Yellow rings

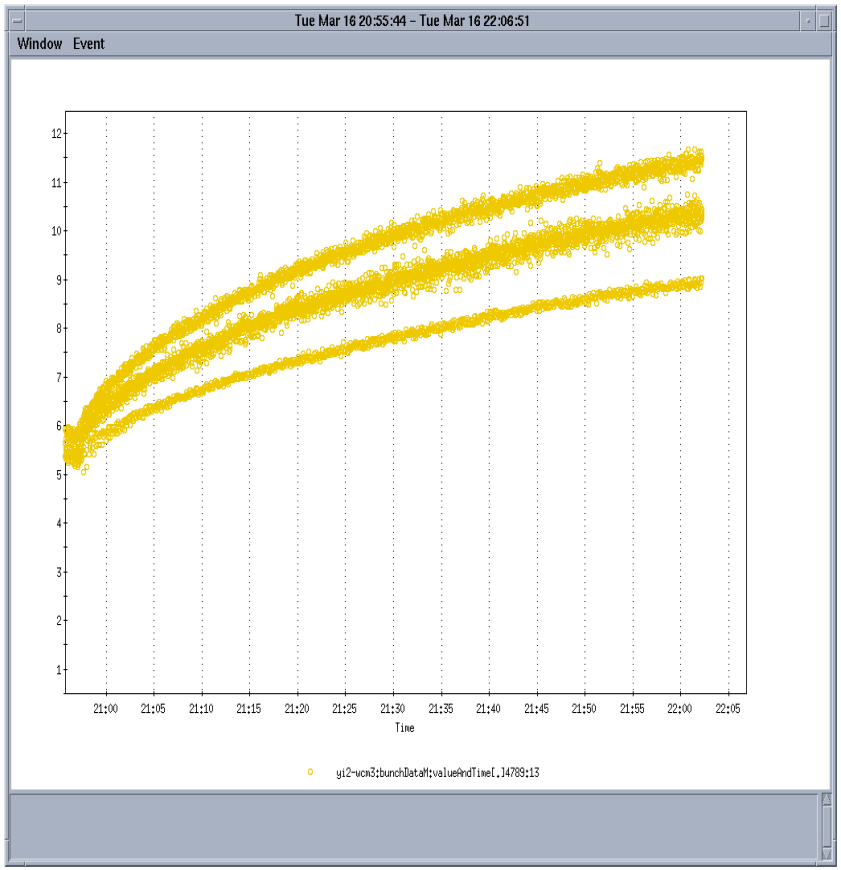
Longitudinal: good data

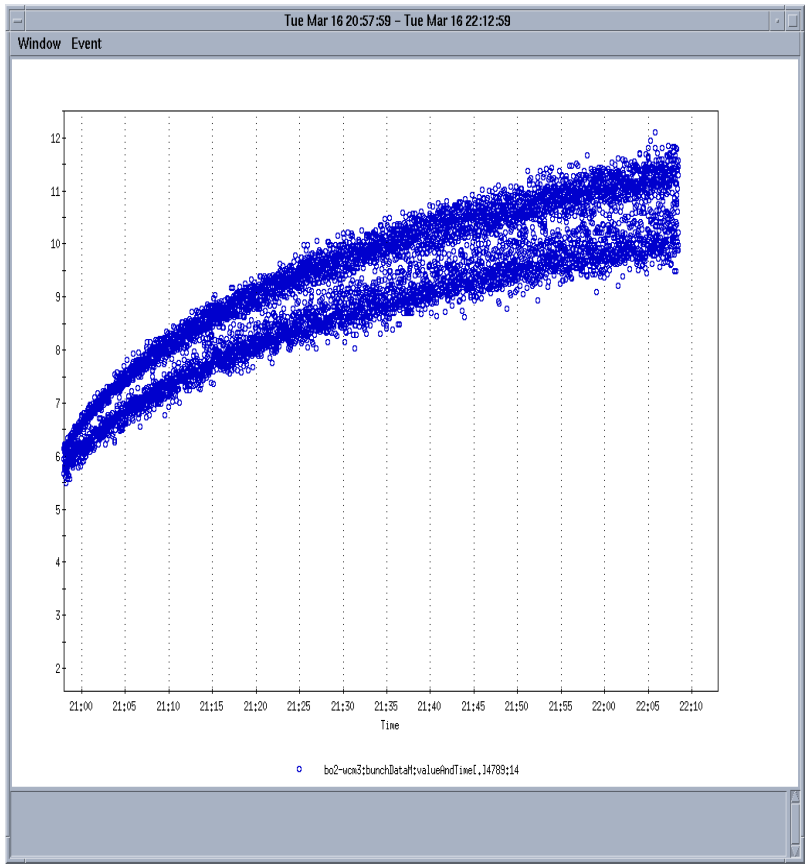
Vertical: yellow - good, blue - good

Horizontal: yellow - good, blue - too noisy - bad

We have data for different intensities and emittances – should be sufficient for comparison with the models.

# Longitudinal bunch length growth

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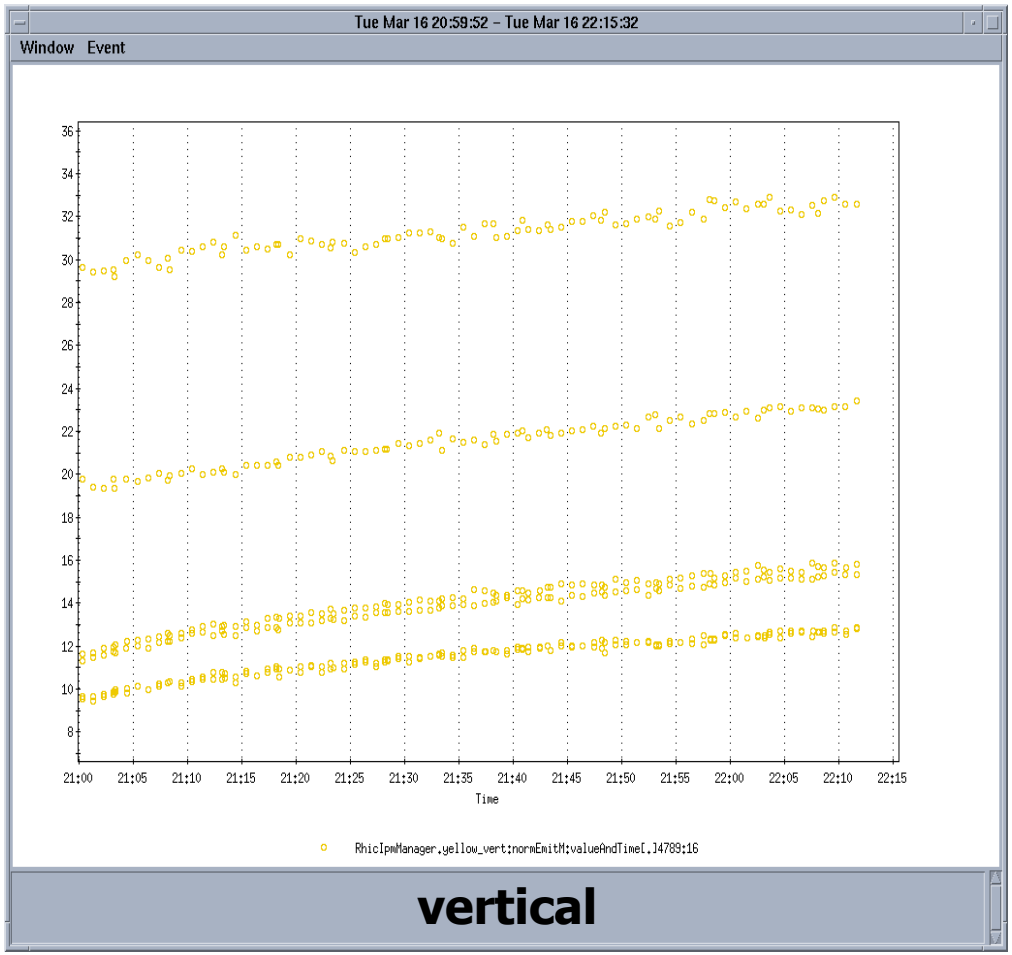
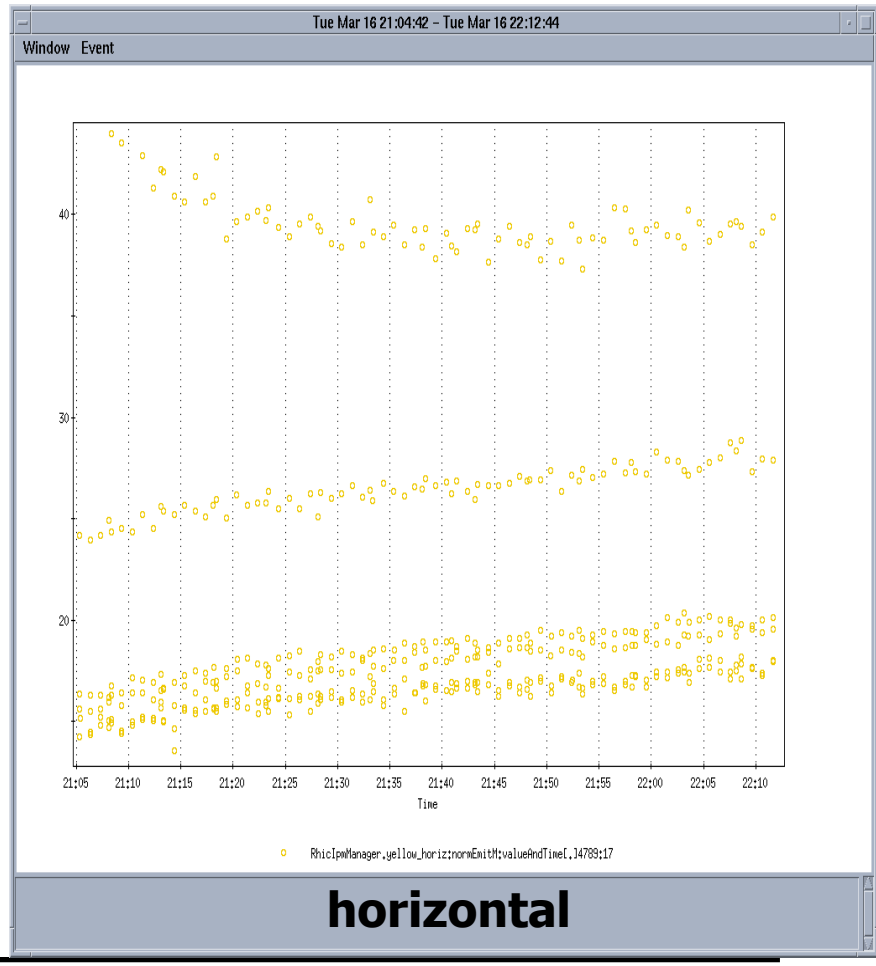
# Yellow: Transverse emittance growth – IPM measurements




vertical




horizontal

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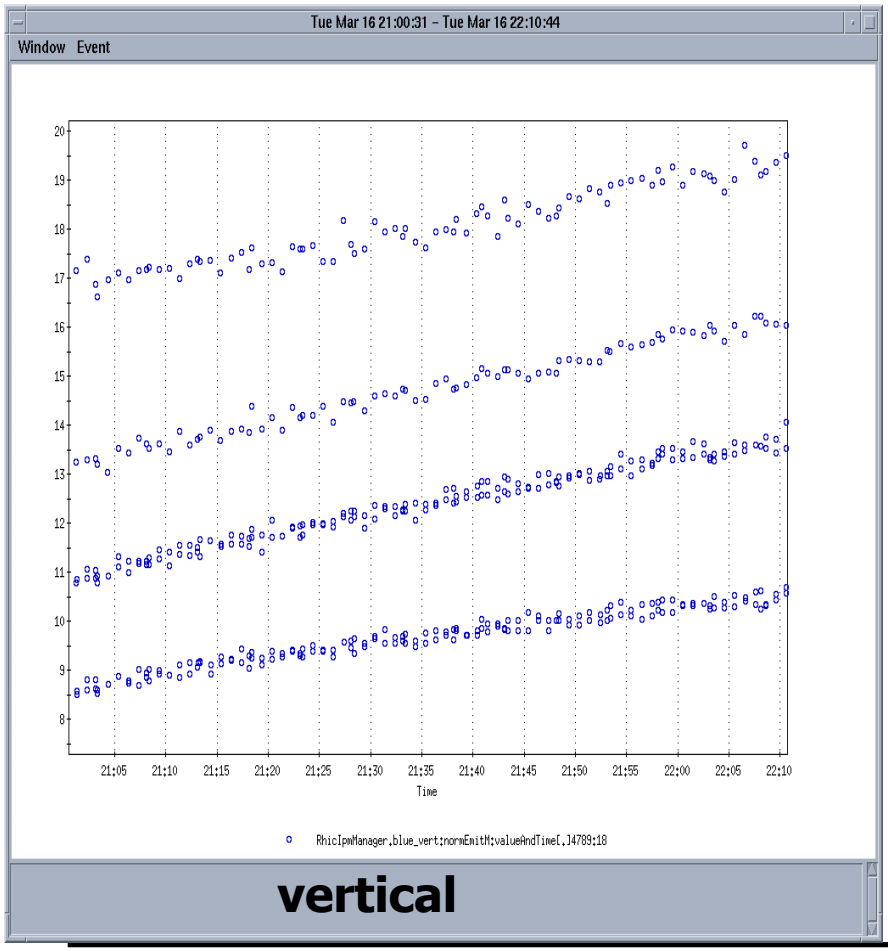
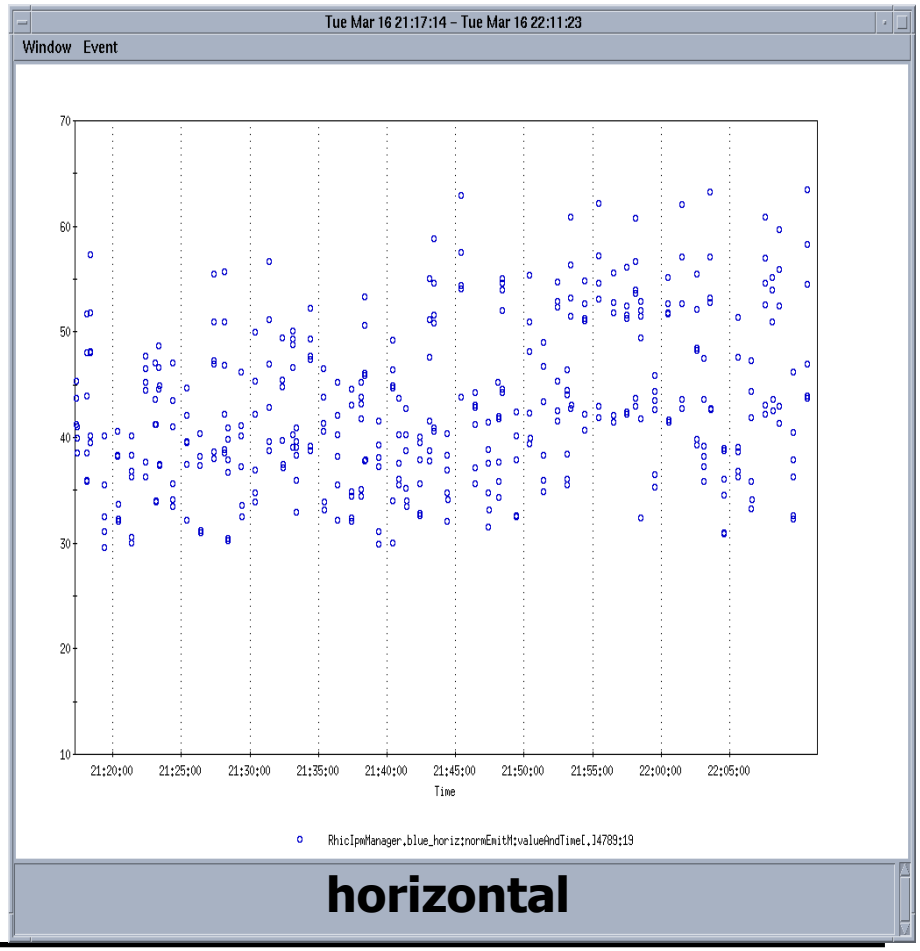
# Blue: Transverse emittance growth – IPM measurements




vertical




horizontal

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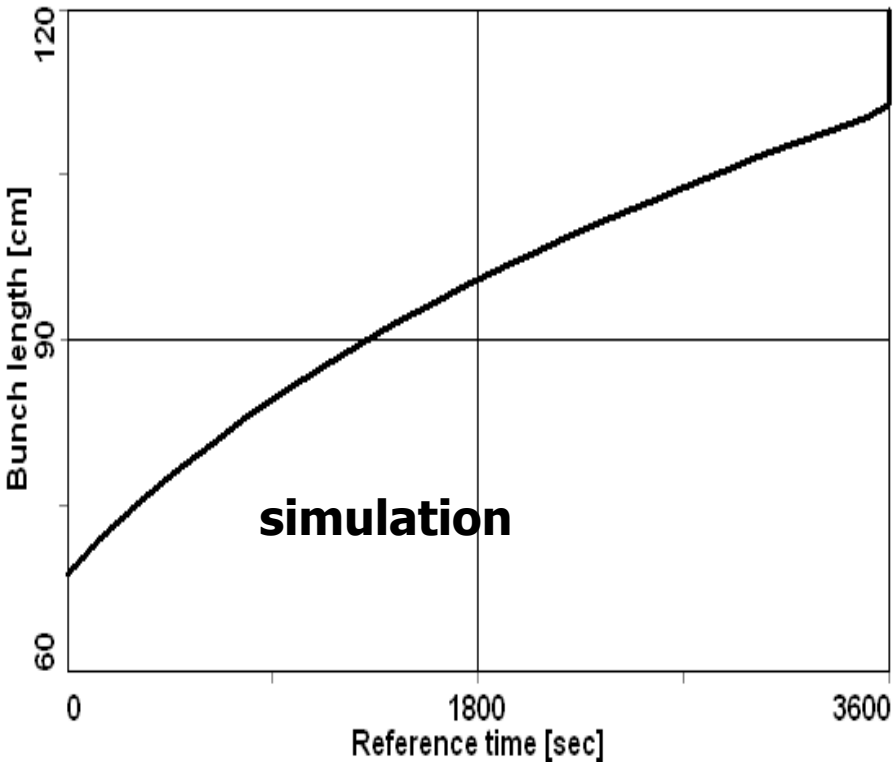
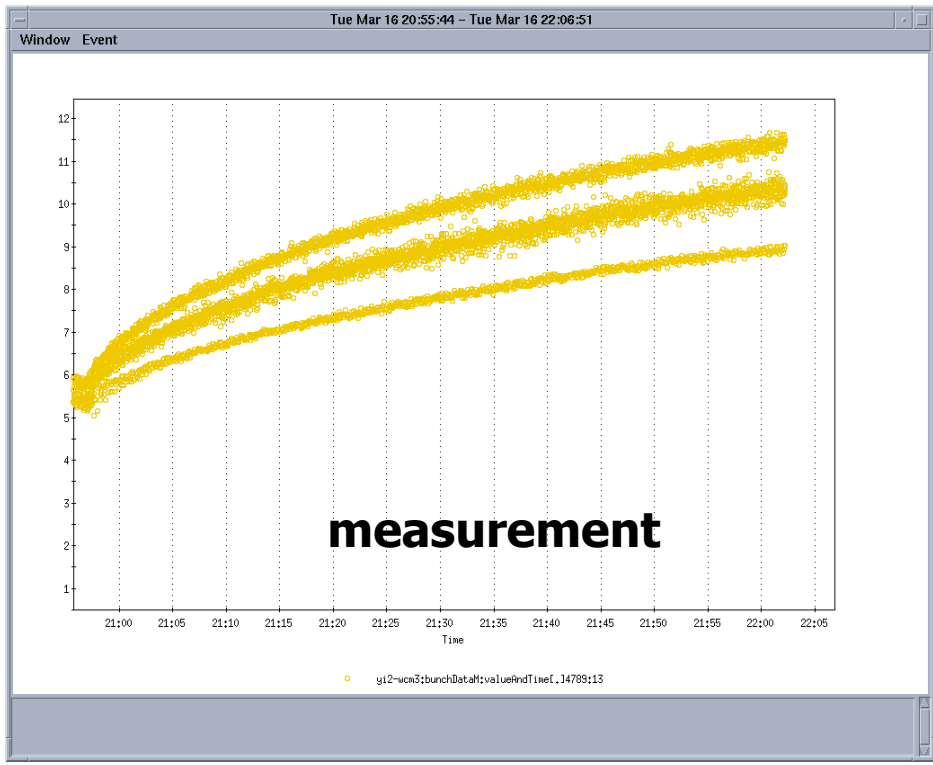
# Longitudinal: simulations & measurements

**good agreement**

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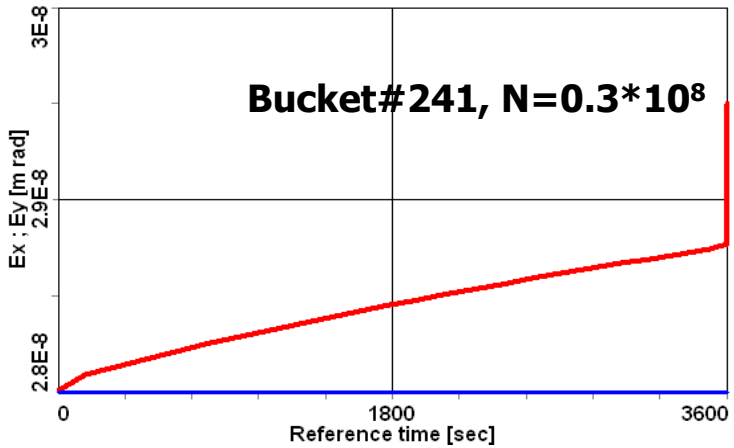
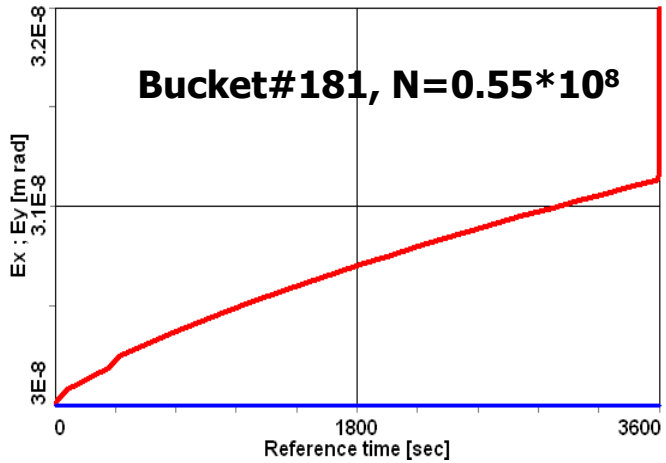
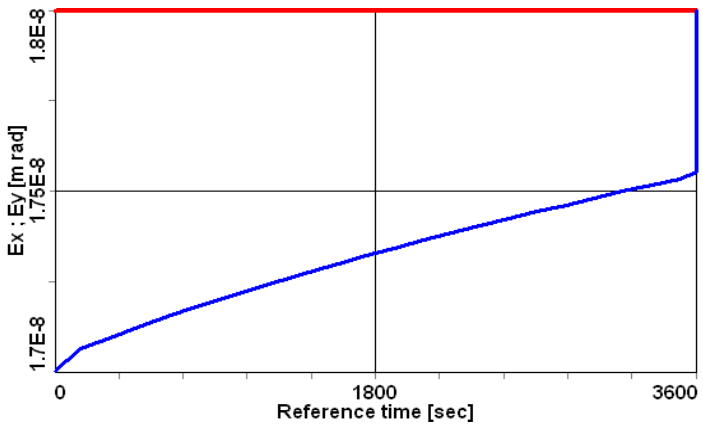
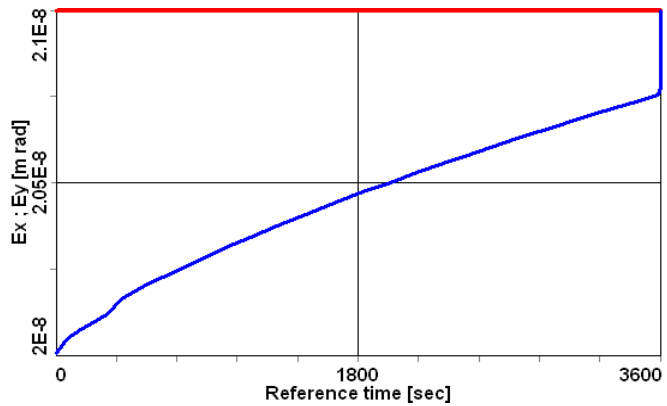
# Simulation: transverse emittance growth

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# Comparison with models started

**Longitudinal:** good agreement

**Transverse emittance growth:**

**Example for bunches in buckets #241 & #181 (yellow):**

**Measurements:** 1. $N=0.3*10^9$: Ev -> 15%, Eh -> 13%

2. $N=0.55*10^9$: Ev -> 30%, Eh -> 25%

**Simulations:** 1. 3% growth

2. 4-5% growth

something to think about